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THE
BRADSHAW LECTURE
1900.

JOHN LANGTON

1.J.229

Richard Gill Esq
with the Authors kind regards.

The Bradshaw Lecture for 1900

THE
ASSOCIATION OF INGUINAL HERNIA
WITH THE
DESCENT OF THE TESTIS

Delivered before the Royal College of Surgeons, December 12, 1900

BY

JOHN LANGTON

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1901

THE BRADSHAW LECTURE FOR 1900.

THE

Association of Inguinal Hernia with the Descent of the Testis.

MR. PRESIDENT AND GENTLEMEN,—The first lecture, under the Bradshaw bequest, was delivered eighteen years ago by the late Sir James Paget, who, since the last lecture by Mr. Howse, has passed to his rest, full of years and honour. From whatever aspect we view his career, be it his professional, scientific or his deeply religious life, or be it his untiring energy, his ceaseless work, or his never failing courtesy, all must recognise that he fully upheld the highest traditions of our profession, and that he lived his life, a noble example to us and a pattern for all time.

The title of his lecture, as many here will recollect, was, "Some new and rare diseases." I cannot claim such a novel and interesting subject for my lecture to-day on "The association of hernia with the descent of the testis," for it is a subject so old that it claims its centuries of literature; it is so common that it probably affects not less than 5 per cent. of the entire population at all ages of life.

THE ASSOCIATION OF HERNIA WITH THE DESCENT OF THE TESTIS.

I.—*The development and the descent of the testis.*— The descent of the testis is a developmental process which exerts a dominant influence as a cause of hernia in infant life, an influence, however, less powerful as age advances. The journey of the testicle from its original site of formation below the kidney to its ultimate destination in the scrotum, materially weakens the lower abdominal walls and thus contributes in no small degree to the extrusion of some of the abdominal viscera, especially when associated with a congenitally elongated mesentery. This want of parietal integrity is chiefly manifested in the early periods of life, but the weakness left by the passage of the testes to the scrotum exists in a greater or less degree throughout life, and thus acts as a predisposing factor of hernia at all ages.

The testes, *ab initio*, are developed in the lumbar regions below the kidneys, and later on, about the seventh or eighth month of intrauterine life, make their descent towards the scrotum, which they have usually reached before birth. The left testis descends three weeks in advance of its fellow, so that the complete developmental processes have been attained on that side at birth, whereas those on the right side are not complete. Many dissections have been made by Camper, Paletta, Schreyer, Seiler and others, who have demonstrated failures in the closure of the vaginal process of the peritoneum, amounting on the right side to 25 per cent., on the left side to 13·5 per cent., and on both sides to 35 per cent.[1] It is noteworthy that frequently, probably more often than not, the processus vaginalis is unclosed to a greater or less extent at birth without any hernial protrusion, thus affording a reasonable inference that hernia does not exclusively depend on the patency of this peritoneal prolongation. Later on I shall call attention to the fact that the vaginal process may be completely patent throughout life without the occurrence of a hernial excursion. The more frequent failure in the occlusion of the right vaginal process at birth explains the large preponderance of congenital hernia on the right side as compared with the left.

The descent of the testis is accomplished in part by the greater development of the upper part of the body, in part by a vital process, but chiefly by the action of the gubernaculum testis.[2] The gubernaculum, situated between the peritoneum and the psoas muscle, is attached by its upper end or apex to the testis, while its lower end frays out like a goose's foot; one of these lower processes is attached to the pubic crest, a second and by far the largest and strongest part passes into the scrotum, while the third portion is attached to Poupart's ligament close to the inguinal canal. Sometimes accessory prolongations can be demonstrated passing to the saphenous fascia in front of Scarpa's triangle and more rarely to the perineum, where they become lost in the tissues about the region of the anus and the ischial tuberosities. These aberrant fasciculi account for the abnormal positions in which ectopic testes are from time to time found. This muscle attains its maximum development about the sixth month of intrauterine life, and according to Lockwood,[1] consists at the third month of fœtal life partly of unstriped muscular tissue, and partly of fibres forming the ascending cremaster muscle which is situated immediately beneath the peritoneal investment of the gubernaculum. About the seventh month the fibres are abundant, and consist

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[1] Camper reports that in 52 cases the vaginal process was patent in 11 instances on the right side, in 6 instances on the left side and in 23 cases on both sides. Seiler found the canal still unclosed in 4 instances on both sides, in 5 on the right side and in 4 on the left side, out of a total number of 21 cases.

[2] John Hunter: "Descent of the Testicle in the Animal Economy," London, 1786. Braumann: Archiv. für Anatomie und Physiologie, 1884, p. 310. Cleland: "Mechanism of the

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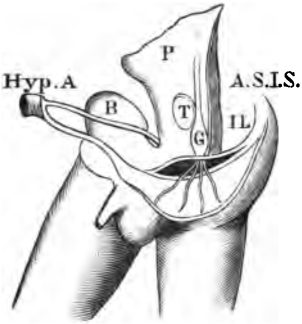
Gubernaculum Testis, 1856," p. 34. Weil: Ueber den descensus testiculorum, Zeitschrift für Heilkunde, 1884, p. 226. Godard: Etudes sur la Monorchidie et la Cryptorchidie chez l'homme, Compts Rendus de la Societé de Biologie, Paris, 1857, p. 315.

[1] C. B. Lockwood: "Development and Transition of the Testis," London, 1888, pp. 97 and 102. Kocker: Die Krankheiten der Menschlichen Geschlecht. Organe, 1887. McCarthy: Quain's "Dictionary of Medicine," 1882.

of striped muscular tissue. It corresponds in its connections with the cremaster muscle in the adult male and its homologue in the female is represented by the round ligament.

The testis is invested in front by the peritoneum, and in its descent to the scrotum carries with it a peritoneal process which precedes it, and eventually forms the tunica vaginalis testis. This serous prolongation does not appear to be dependent on the testicular descent, for instances are not rare in which the testis is completely retained, while the vaginal process is fully developed in the scrotum and shut off from the general abdominal peritoneal cavity. Specimens illustrating this condition exist in most of the hospital museums, and an especially instructive one in the University College Hospital

FIG. I.

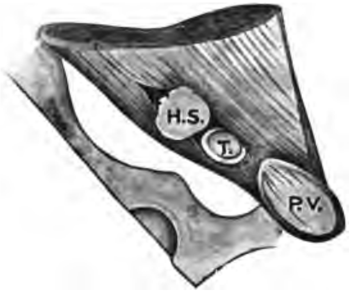


(*After Lockwood.*)

A.S.I.S., Ant. Superior iliac spine. IL, Iliacus with psoas internal to it. T, Testis. G, Gubernaculum. B, Bladder. P, Peritoneum. Hyp. A, Hypogastric artery.

Museum[1] removed from a cryptorchid exhibits a well-developed processus vaginalis in each half of the scrotum. I have on many occasions observed instances of a long vaginal process containing more or less typical hydrocele fluid lying in advance of a partially descended testis, an example of which condition is seen in the annexed drawing.

FIG. 2.



H.S., Sac of hernia. T., Testis. P.V., Processus vaginalis.

Mr. Hulke in the *Medico-Chirurgical Transactions*,[2] records an instance of an oblique inguinal hernia in which the testis remained within the abdomen on both sides, associated with two hernial sacs which had descended into the scrotum and also ascended in front of the aponeurosis of the external oblique muscle. The patient was subjected to operation for strangulated intestine on the right side. He died thirty hours after the operation, and at the *post-mortem* examination it was discovered that on the left side the testis was situated in the inguinal canal behind the omentum, not attached, as is usual, to the posterior wall, but hanging from a fold of peritoneum dragged down from the parietal layer near the abdominal surface of the internal ring. On the right side three and a half feet of small intestine had been strangulated and the right testis hung freely within the cavity of the belly by a mesorchium drawn from the parietal peritoneum at the pelvic brim near the inner ring. There are several interpretations of this unusual case, and the most probable one is that these large well-developed scrotal sacs were the outcome of the hernial pressure, not unlikely interstitial in the first instance, and had subsequently by gradual increase descended into the empty scrotum. Examples of this condition are frequently seen in interstitial hernia and its varieties. The result of Mr. Hulke's case, as in many instances of strangulated congenital hernia, was fatal. Instances are not infrequent of a frayed epididymis, almost detached from the testis and its vas deferens, having reached the upper part of the scrotum, while the testis remains completely retained within the inguinal canal.[1]

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[1] University College Hospital Museum, Specimen 1137; St. Bartholomew's Hospital Museum, Specimen 2136.

[2] Hulke: Medico-Chirurgical Transactions, vol. xlix., p. 189.

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[1] Curling, T. B.: "A Practical Treatise on the Diseases of the Testis," 1878.

Follin: Thèse sur les corps de Wollf, Paris, 1850. The summary is given in the Archives Generales de Médécine. Guy's Hospital Museum, Specimen 2339^{80}. In this specimen

In passing I may observe that Cleland arrives at the conclusion that complete retention of the testes is compatible with functional activity. In support of this conclusion he states that in fishes, reptiles, birds and some mammalia, the testes are situated within the abdomen, while in man alone the tunica vaginalis is so completely closed as to separate these organs from the general peritoneal cavity. In all mammals these secreting glands are originally developed within the abdomen, and in the female they are always completely retained within that cavity.[1]

The upper portion of the peritoneal process, pushed in front of the testis during its descent into the scrotum, becomes normally obliterated by the closure of its canal from the internal abdominal ring to the upper part of the testis and subsequently dwindles into a long slender cord, whilst the lower portion of the process forms the investing sac of the testis, as its tunica vaginalis testis. That obliteration of this process also takes place from below upwards little doubt can exist, for it is by this incomplete developmental process that we explain the common variety of congenital hernia known as hernia into the funicular process. Complete failure

---

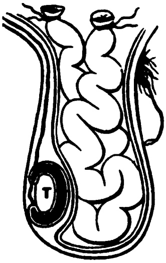
the left testis lies behind the external abdominal ring, while the epididymis contained within a process of peritoneum lies within the canal. On the right side there is also an arrest of development, as the cavity of the tunica vaginalis testis still communicates with the abdominal peritoneal cavity.

[1] Cleland: *Oper. Cit.*, p. 34.

in the closure of the process is frequently observed, and in this condition the abdominal peritoneal cavity communicates directly or by a valvular canal with the cavity of the testicular sac. If a hernia descends into this sac of the tunica vaginalis it is usually designated a congenital hernia, or preferably a hernia into the cavity of the tunica vaginalis testis.

II.—*The anatomical aspect of the varieties of congenital hernia.*—The term congenital hernia lacks exactness, as it is capable of two interpretations: one, that the hernia dates from birth, which may not be strictly accurate; the other, that it is dependent upon some arrest in the complete development of the vaginal process of congenital origin, which is correct. This nomenclature should be strictly confined to the anatomical defect and not to the assumed chronological appearance of a hernia, for which we have only the statement of the patients' relations.

FIG. 3.



The usual relation of the sac to the testis and the vas deferens in acquired hernia.

In acquired inguinal hernia the protrusion with its sac usually lies in front of the cord and the testis, the sac being but loosely connected with the cord and from which it can be easily dissected. In congenital hernia, on the other hand, the constituents of the cord, notably the vas deferens, are firmly attached to the sac, so that it requires careful dissection to separate from the surrounding tissues the thin diaphanous membrane which constitutes the congenital sac and thus increases the difficulty of the operation for the radical cure of this variety of hernia. Sir William Lawrence, in his admirable "Treatise on Ruptures," to which term, by-the-bye, much exception may be taken, and other authors have also felt the inappropriateness of the word congenital; for the former states in a footnote, that in a limited sense the term "congenital hernia" may be condoned, but he further adds, "I cannot understand for what reason Mr. Pott and some others have exchanged this for the appellation *congenial*, which according to its common use and acceptation must be perfectly absurd as applied to this or any other form of rupture."[1]

I would therefore suggest that all inguinal hernia dependent on, or associated with, some faulty congenital development of the vaginal process should be classed under the general heading of congenital hernia, which may, with advantage, be subdivided into the following varieties based on their anatomical features.[2]

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[1] Lawrence: "Treatise on Ruptures," p. 491.

[2] See also page 40.

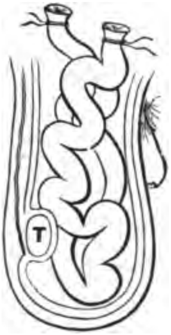
CONGENITAL HERNIA.

(*a*) Into the cavity of the tunica vaginalis testis.
(*b*) Into the funicular process.
(*c*) Infantile and encysted hernia.
(*d*) Interstitial hernia.

(*a*) A hernia into the cavity of the tunica vaginalis testis mostly presents, except in infants, distinctive characters, which are that the testis is situated at the back of the sac, and is surrounded by the intestine or omentum as it is in an ordinary vaginal hydrocele by fluid. The neck as a rule is narrow and the hernia assumes a globular appearance.

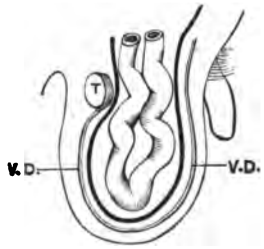
First variety.—Hernia into the cavity of the tunica vaginalis testis.

FIG 4.



The usual form of a hernia into the cavity of the tunica vaginalis testis.

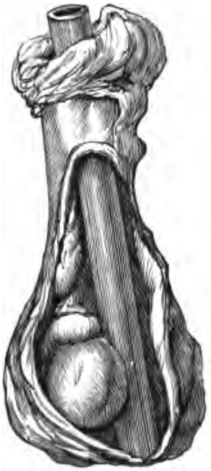
FIG. 5.



Hernia into the cavity of the tunica vaginalis testis with the vas deferens lying in front of the hernia.

Figs. 4, 5 and 6 represent this form of hernia and show the formation of the sac and its relation with the testis. The testis usually lies posterior to the hernia, but in instances of axial rotation of that organ it may be situated anterior to the protrusion. In fig. 5, is represented an abnormality in the course of the vas deferens which in this instance curves under the sac and in its ascent lies in front of the hernial sac.

FIG. 6.



Specimen of a hernia into the cavity of the tunica vaginalis testis. St. Bartholomew's Hospital Museum, No. 2138.

(*b*) The second variety of congenital hernia is known as a funicular hernia, the hernial protrusion descending into the vaginal peritoneal process, which is closed only at its lower part and shut off from the testicular sac.[1] Figs. 7, 8, 9 and 10 represent the developmental closure of the vaginal process from below upwards but fails to close at its upper part, into which a hernia may descend. In fig. 7, the lower end of the vaginal process has commenced its narrowing, but it still communicates through a large neck with the cavity of the tunica vaginalis testis. This is the commencement of the

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[1] St. Bartholomew's Hospital Museum, Specimen 2140a.

Second variety.—The method of closure of the funicular process with a hernia into its unclosed portion—*funicular hernia.*

FIG. 7.

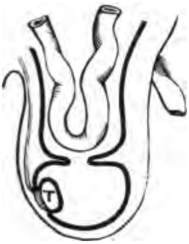


FIG. 8.

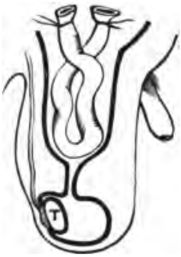


FIG. 9.

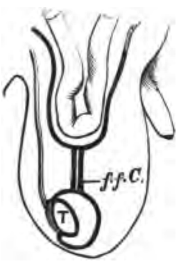
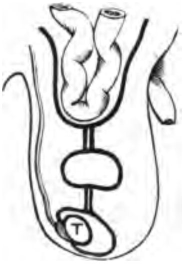


FIG. 10.



(*After Félizet.*)

FIG. 7.—Hernia into the funicular process with a large patent neck communicating with the cavity of the tunica vaginalis testis.

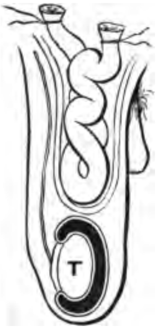
FIG. 8.—Hernia into the funicular process with a long narrow canal communicating with the patent tunica vaginalis testis.

FIG. 9.—Hernia into the funicular process which is connected by a long thin cord with the tunica vaginalis testis; the two sacs being now separated by the filament fibreux de Cloquet (*f.f.C.*).

FIG. 10.—Funicular hernia with an encysted hydrocele of the cord between it and the tunica vaginalis testis.

closure of the process and in this stage there is often some fluid which is easily reducible with the intestine into the abdominal peritoneal cavity. In fig. 8, the second stage is represented, in which the funicular sac is more constricted and is separated further from the testis with its tunic, but still communicates with its cavity by a longer and narrower canal. In this stage fluid is also frequently present, but when the taxis is applied it is reduced gradually and does not descend so rapidly when pressure is removed as in the first stage. This narrow canal becomes still more elongated, and later on closed so that in fig. 9, no communication exists between the testicular and funicular sacs. The long white fibrous cord connecting the two sacs is called the filament fibreux de Cloquet, which frequently encloses a small narrow canal. This may become dilated by a collection of fluid and then forms an encysted hydrocele of the cord as represented in fig 10. This long canal however usually becomes completely closed, and is converted into a white fibrous cord which is easily recognised during the operation for the radical cure of hernia.[1]

FIG. 11.



Hernia into the funicular process—Funicular hernia.

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[1] Birkett, John : " Holmes' System of Surgery."

The funicular sac is usually long and evenly sausage-shaped, but it may be constricted in one or more places, giving the appearance of two or more bulges in the hernial protrusion. In operating for the radical cure an annular thickening is often recognised when the sac is opened about the middle and narrowest part of the process. In two instances I have noticed a diverticulum in the sac immediately above this constriction. The cause of this ring of fibrous tissue is undetermined, for while by some it is ascribed to the displaced neck of the sac, by others it is thought to be the remains of the incomplete closure of the lower part of the vaginal process.[1]

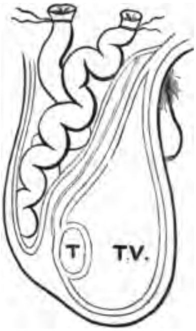
(*c*) The third variety of congenital hernia known as infantile hernia occurs when the closure of the vaginal process takes place at the internal ring only, leaving the remainder unclosed, so that the tunica vaginalis testis, sometimes filled with fluid, extends as far as the inner ring. Under these circumstances a hernia may be protruded behind the closed portion and then descend behind the patent tunica vaginalis testis as far as the bottom of the scrotum, as in fig. 12. Sometimes the abdominal termination of the processus vaginalis is patent as in fig. 14, so that its closure at the inner ring is not essential to constitute an infantile hernia.

---

[1] *See* St. Bartholomew's Hospital Museum, Specimen 2123.

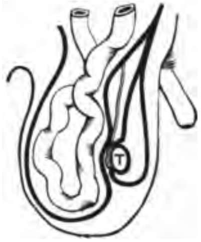
Third variety.—Infantile hernia, in which the hernial sac with its contents lie behind the testis surrounded by its elongated tunica vaginalis testis.

FIG. 12.



Intantile hernia with a large testicular sac.

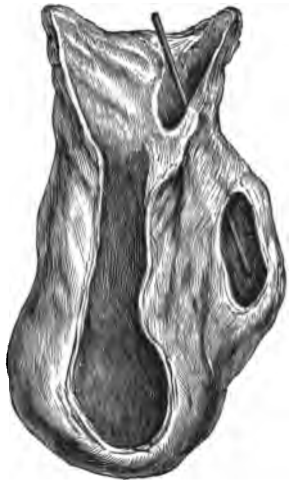
FIG. 13.



Infantile hernia with a small testicular sac.

A hernial sac which lies behind a patent tunica vaginalis testis.

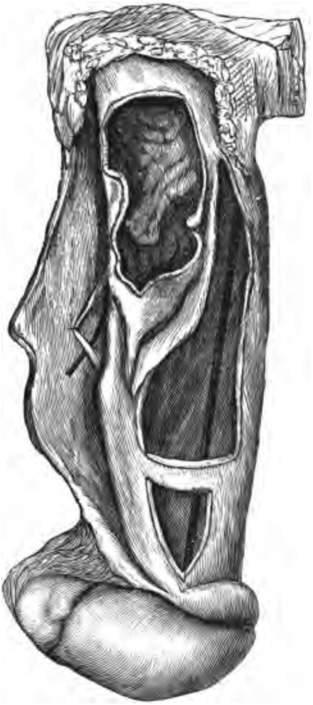
FIG. 14.



Infantile hernia into a sac behind the cavity of a patent tunica vaginalis testis into which a hernia also descended.

The capacity of the testicular sac varies, as seen in fig. 12 and 13. If, as in the first diagram, the cavity is large the hernia may be overshadowed by the vaginal sac when distended by a large amount of hydrocele fluid, but if the cavity is small the testis with its sac lies imbedded in a depression in front of the hernia. It occasionally happens that the testis lies in front of its sac as if the organ had been half rotated on its axis.

FIG. 15.



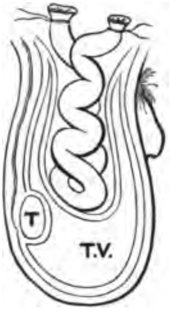
Infantile hernia.
St. Bartholomew's Hospital Museum, Specimen 2140b.

In fig. 15, the vaginal process of the peritoneum is closed at its upper end on a level with the internal ring, but for the rest of its extent it exists as an oval tube, shut off from the cavity of the tunica vaginalis testis below, and a hernia has descended behind the inner ring posterior to the unclosed funicular process. Another variety of infantile hernia is occasionally described in which the hernia, instead of continuing its course behind the cord and the testis, pushes itself forwards into the unclosed vaginal process, which, when opened, displays a convex tumour bulging the posterior wall of the sac forwards and occupies more or less of its cavity. This is one of the forms of the so-called encysted hernia of Hey, and its pathology has been carefully described by Mr. Lockwood, in which he shows that it is a modified and rarer variety of infantile hernia. In infantile hernia the walls of the sac are much thicker than in the so-called encysted hernia, which by some authorities is described as a variety of infantile hernia, but by others is regarded as a distinct lesion, under the name of encysted hernia.

The encysted variety of congenital hernia presents special characters which differ materially from those of the variety previously described. It consists of an oval fibrous sac, invaginated into the unclosed vaginal process and is attached by its broad neck to the margin of the inner ring. The sac hangs vertically in the vaginal cavity and presents a

Fourth variety.—Encysted hernia.

FIG. 16.



The hernial sac is invaginated into the cavity of an infantile hydrocele or into the empty sac of the tunica vaginalis testis.

FIG. 17.

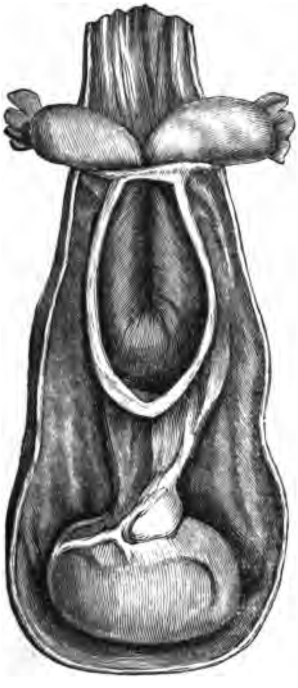


FIG. 18.

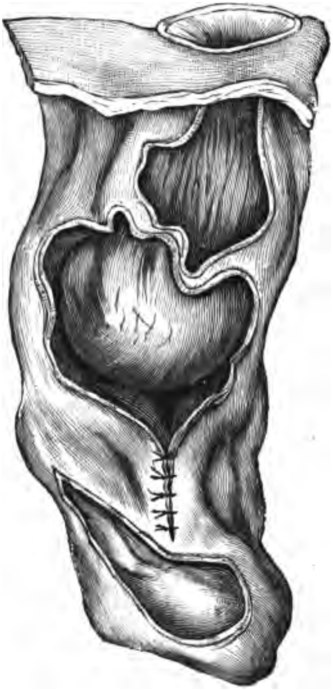


FIG. 17.—Encysted hernia. Astley Cooper.
FIG. 18.—Encysted hernia. St. Bartholomew's Hosp. Museum.

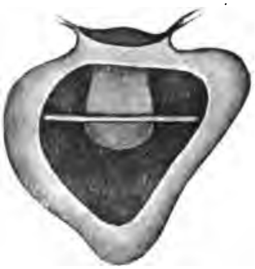
marked contrast to the firm, fleshy, globular sac of an ordinary infantile hernia.

In an illustration in Astley Cooper's work (plate xi.), there is represented an oval fibrous sac containing a loop of intestine hanging by its neck into the cavity of a dilated tunica vaginalis testis (fig. 17); and fig. 18 affords, in my opinion, also an example of the so-called encysted hernia.

Some months ago I operated at St. Bartholomew's Hospital on a young man for the cure of an inguinal hernia which was considered to be an ordinary funicular hernia but with a thicker sac than usual. I opened what we deemed was the sac of the hernia, when about two ounces of ordinary hydrocele fluid escaped from the sac which extended up to the inner ring. On this hydrocele sac being emptied we discovered suspended in it an oval, white, fibrous bag, the size of a large olive, which had contained a hernia, but was now empty. It was firmly connected with the upper margin of the enclosing sac and communicated through a large neck with the abdominal peritoneal cavity, as shown in the following illustration. The testis was carefully dissected from the outer sac which was the unclosed vaginal process.

The associated sacs, both much shrunken since being preserved in spirit, may be considered as an example of infantile hernia, but their connections, situations and structure differed so much from those of infantile hernia, that the case should be classified as a distinct variety of congenital hernia. My explanation of this specimen is that the large sac containing serous fluid was a funicular hydrocele separated from the testicular sac, and that a secondary sac had been invaginated into it by a hernia and thus corroborated Hey's description of the encysted form of hernia.

FIG. 19.



Encysted hernia. St. Bartholomew's Hospital Museum, Specimen, 2140^{c}.

The Surgical and Pathological Aspects of the Various Forms of Congenital Hernia.

Experience shows that hernia under 12 months of age is much more frequent in males than in the opposite sex. Inguinal hernia occurs eleven times more often in boys than in girls under 1 year, the exact figures being 3,215 infant boys to 290 infant girls. These numbers refer to the date of the first application of the patients for relief and not to the date of the presumed first appearance of the lesion. The importance of differentiating the first application by the patients to the surgeon from the first discovery of the hernia, cannot be too strictly enjoined. The first is verified by the surgeon and cannot fail to be correct; whereas the second not only includes all patients examined under 1 year of age, but also those who apply for relief in later years and date the first occurrence of their hernia from birth. The statements of patients are often too inexact to be accepted as reliable for statistical purposes. The proportion of ruptured males to females under the first heading is eleven males to one female, while under the second heading, of those who state that their herniæ dated from birth, it is as sixteen to one. Inguinal hernia in infant boys occurs three times more frequently on the right side than on the left, whereas in infant girls the two sides are nearly equal in their incidence. This disproportion between the two sides in boys is explained by Camper and others to be due to the processus vaginalis being much more commonly patent in boys at birth on the right side than on the left. The persistent preponderance of ruptured boys as compared with ruptured girls, and which repeats itself so regularly year after year in the records of the City of London Truss Society, is accounted for, firstly, by the structural weakness of the lower abdominal parietes, due to the passage of the testis through them during intrauterine life, whereby the walls are unable to resist the constant pressure from within, and, secondly, to the failure of the perfect occlusion at birth of the processus vaginalis.

The following table gives the relative frequency of hernia in each quinquennial period as stated by the patients as to the date of the first discovery of their herniæ. It shows that during the first year of life hernia reaches the high percentage of 15·22 per cent. of the total number in boys compared with 8·55 per cent. in girls. There must, therefore, be some other dominant cause of hernia in boys in addition to the general tendency to hernia in both sexes; and this factor is the descent of the testis prior to birth.

TABLE I.

SHOWS THE PERCENTAGES, IN EACH LUSTRUM, OF INGUINAL HERNIA, IN MALES AND FEMALES, AT THE TIME OF FIRST DISCOVERY.

Ages.		Males.		Females.
0	...	15·22	...	8·55
1— 5	...	4·32	...	7·08
6—10	...	2·86	...	6·91
11—15	...	3·71	...	5·75
16—20	...	8·88	...	9·90
21—25	...	9·67	...	11·55
26—30	...	11·10	...	12·53
31—35	...	9·08	...	9·88
36—40	...	9·30	...	9·98
41—45	...	7·03	...	5·78
46—50	...	6·56	...	4·39
51—55	...	4·61	...	2·77
56—60	...	3·65	...	1·68
61—65	...	2·15	...	1·65
66—70	...	1·21	...	1·35
71—75	...	0·43	...	0·45
76—80	...	0·21	...	0·10
81 —	...	0·01	...	—
		100·		100·

Children born prematurely are very liable to hernia at birth, and so far as my experience extends the protrusion occurs more frequently on both sides than when infants are born at full term. The cause of this is not far to seek, for under these circumstances the vaginal processes are patent on both sides. The following Table (II.) shows that inguinal hernia occurs for the first time more frequently in infant life than in later ages, and this accords not only with our expectancy but also with statistics. It also supports the theory that the descent of the testis is largely responsible as an active cause of hernia. Table III., which refers to the occurrence of hernia in women, shews conclusively that inguinal hernia in them is much less frequent, and that the two sides are more evenly affected than in boys.

TABLE II.

SHOWS THE RELATIVE FREQUENCY OF RIGHT, LEFT AND DOUBLE INGUINAL HERNIA IN MALES IN SUCCESSIVE LUSTRA AT THE TIME OF ITS FIRST DISCOVERY.

Ages.	Right.	Left.	Double.
Cong.	2,610	822	495
1— 5	783	283	87
6—10	483	267	49
11—15	581	347	67
16—20	1,318	814	193
21—25	1,416	993	296
26—30	1,428	1,171	327
31—35	1,161	984	271
36—40	1,215	917	264
41—45	843	710	296
46—50	819	615	196
51—55	609	511	136
56—60	472	329	113
61—65	287	193	64
66—70	179	88	38
71—95	118	61	29
	15,312	9,105	2,901

Total, 27,318

TABLE III.

TABLE SHOWING THE NUMBER OF CASES OF INGUINAL HERNIA IN FEMALES, IN SUCCESSIVE LUSTRA, AND THE PERCENTAGES OF RIGHT AND LEFT HERNIA AT THE TIME OF FIRST DISCOVERY.

				Percentages.	
Ages.	Right.	Left.	Double.	Right.	Left.
Cong.	198	154	54	56·0	44·0
1— 5	227	99	28	70·0	30·0
6—10	168	107	28	60·0	40·0
11—15	138	94	16	60·0	40·0
16—20	234	159	27	60·0	40·0
21—25	220	251	40	46·7	53·3
26—30	235	238	55	49·9	50·1
31—35	187	193	40	49·9	50·1
36—40	190	204	33	48·2	51·8
41—45	95	135	22	41·0	59·0
46—50	90	78	20	53·0	47·0
51—55	52	58	8	47·0	53·0
56—60	31	39	8	44·3	58·7
61—65	33	37	5	47·0	53·0
66—70	26	26	3	50·0	50·0
71—95	8	16	2	33·3	66·6
	2,132	1,888	389		

Total, 4,409.

RETAINED, PARTIALLY DESCENDED AND ECTOPIC TESTES.

Herniæ are largely associated with testes which fail to descend to their normal position in the scrotum. These organs may be completely retained within the abdomen, in the inguinal canal, or may be situated in the inguino-scrotal region. They may, further, be misplaced in regions outside their normal course of descent, so that they may be found in the thigh, perineum and peno-pubal regions. When testes have been arrested in their descent, or belated, or ectopic, they are often associated with hernial extrusions, although they are frequently free from such complications.

In infants under 12 months of age one or both testes may apparently be retained within the inguinal canal, but a little gentle traction is often sufficient to overcome the action of the cremaster muscle, and may by this manipulation be brought to their normal position in the scrotum. Their mobility is proportionately in excess of that in adults, and in good health the testes in infants are situated high up in the scrotum, being maintained in this position by the vigorous action of the cremaster and dartos. Instances are constantly seen of testes being permanently in the canal without any hernial complication. This condition need not engage our attention so long as it is not connected with hernia, but it must be borne in remembrance that at some future date such association may occur. It is often stated that retained testes are liable in later years to become the seat of malignant disease. My own experience leads me, however, to doubt the accuracy of this statement and the Registrar-General's Reports substantiate this experience.

There is much difficulty in collecting reliable statistics as to the frequency of the association of hernia with malposition of the testis. I am sure, however, that these organs are often misplaced without any association with hernia.

The classification of misplaced testes, in which must also be included ectopic testes, though dependent on different causes, may most conveniently be arranged according to their anatomical positions, as follow :—

(*a*) Testes completely retained within the abdomen.

(*b*) Testes retained within the inguinal canal.

(*c*) Testes situated outside the external abdominal ring.

(*d*) Testes placed in the inguino-scrotal region, high up in the scrotum.

(*e*) Ectopic or misplaced testes contained within a skin pouch in the cleft between the scrotum and the thigh. These skin pouches contain no dartos muscle, and the testes contained in them are often maladroitly designated cruro-scrotal testes, since they are neither in the thigh nor in the scrotum. Included in this class are also testes, situated in unusual positions and due to the action of aberrant fasciculi of the gubernaculum testis in the thigh, the perineum or the pubo-penal regions.

(*f*) Displaced testes due to the pressure of a hernia.

I have examined the records of 7,661 patients, of whom careful notes have been taken. I have not thought it necessary to chronicle a larger number of cases as no greater accuracy is ensured, nor is any additional knowledge gained, while the largeness of numbers is apt to bewilder us.

The total numbers of which notes have been taken include 4,310 cases of right inguinal hernia, 2,812 left inguinal hernia and 539 double inguinal hernia. In 174 instances the testes were misplaced in the following situations :—

TABLE IV.

Testes	Right	Left	Double	Total
(*a*) Completely retained within abdomen	9	4	3	16
(*b*) In inguinal canal	24	15	13	52
(*c*) At mouth of external ring. Small testes	43	27	3	73
(*c*) At mouth of external ring. Testes fully developed...	...	1	1	2
(*d*) Ectopic testes		...	...	2
(*e*) Cruro-scrotal testes		1	...	3
(*f*) Ill-developed testes in scrotum ...	1	1	5	16
(*g*) Mal-posed testes without hernia ...		8	...	10
	92	57	25	174

It is only in the first three and the last classes that the testes have been arrested in some part of their journey and have failed to reach their normal destination in the scrotum. These may be described as *arrested testes.* Classes *d* and *e* consist of *misplaced testes* due to the aberrant action of the gubernaculum testis, while in class *f*, the testes are normally situated in the scrotum, but are only ill-developed. With the exception of class *g* all but two were associated with hernia and were ill-developed testes. This table shows that in 16 cases the testes were completely retained within the abdomen, 9 being on the right side, 4 on the left, while in 3 cases both testes were retained. In 52 patients the testes were retained within the inguinal canal and could not be extruded through the external ring ; of these 24 were on the right side, 15 on the left and 13 on both sides simultaneously. In 73 instances the testis was situated immediately outside the external ring, in the inguino-scrotal region, the right side claiming 43 instances, the left side 27 and both sides 3 examples. In only two instances were fully developed testes situated at the mouth of the external ring, one on the left side and in one case on both sides. The classes *d* and *e* comprise only 5 examples of ectopic testes, the right being represented by 4 cases, and the left by 1 instance, while there is no example of both sides being simultaneously affected. In 16 patients the testes were small and ill-developed in the scrotum, 10 being on the right side, 1 on the left side and 5 on both sides. In 10 cases the testes were malposed, 2 being on the right side and 8 on the left side. It is probable that this number does not adequately represent the relative frequency of misplaced and ill-developed testes inasmuch as patients would not seek advice for this uncomplicated condition. In every class but one the right side claims the predominance of malposition of the testis, since the right side has 92 instances against 57 on the left side, out of a total of 149 cases, the proportion being as twelve to seven in favour of the right side. It is interesting to note that the relative proportion of arrested testes on each side is nearly identical, namely, 14 per cent.

In nearly all the cases the testes were small and ill-developed, most being soft and flattened, while their hypersensitiveness was in many instances a characteristic feature. In operations, both for strangulation and for the cure of hernia, I have frequently found that the testes retained within the canal are larger than those situated outside the canal or in the inguino-scrotal region. This fact suggests the inference that the retention of these organs within the canal is due to their being too large to pass through the external abdominal ring.

Small testes are not rare in association with hernia, and Mr. Wood, in his work on "Ruptures," says: "When of long standing a scrotal hernia is often associated with a testicle more or less atrophied. So often has this condition come under my observation that I am inclined to regard it as a common result of rupture, especially when the pressure of a powerful convex truss has become necessary to retain the rupture.[1]

This explanation of an atrophied testis being the result of a large hernia is hardly convincing. I cannot recall an instance of atrophy being the outcome of instrumental pressure, still less of the pressure of a hernia, however large. In old persons degeneration of the testis in size and in secreting structure no doubt occurs, but this is in great measure due to senile changes. Old people more often have fibrous hypertrophy of these organs from chronic irritation of a senile prostate, irritation of the bladder and other causes. The age at which degenerative changes occur is very uncertain and unequal, for in the very aged the testis often remains normal in size though probably not in function. Curling[1] has drawn attention to this, and subsequently Arthaud[2] has carefully described the histological changes which ensue, and he remarks that the testis becomes more flaccid and wrinkled, although the epididymis remains normal. Griffiths[3] also draws attention to the alterations in senile testes.

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[1] Wood, John: "On Ruptures," p. 67.

The explanation of the association of small testes with hernia is, that the hernia has pushed in front of it an originally ill-developed testis which had been belated in its descent to the scrotum. Patients frequently volunteer the statement that they had no testicle in the scrotum until they became the subjects of hernia. This mechanical descent of the testis in advance of a hernia has frequently been observed in boys as they approach adolescence. Moreover, it appears highly improbable that a hollow viscus, only coming down from time to time, could cause such vascular and nerve disturbance as to interfere with the nutrition of the testis to such an extent as to cause its atrophy.[1]

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[1] Curling, T. B. : "Diseases of the Testis."

[2] Arthaud : Etude sur le testicle senile, Paris, 1885.

[3] Griffiths, J. : Journal of Anatomy and Physiology, vol. xxvi., pp. 474-481.

The absence of a normal scrotum is nearly always associated with an imperfect descent of the testis on the corresponding side. Although in early life a partially descended testis is not necessarily associated with a hernia, yet as the two often go together in later life it is well that patients should be warned of this liability.

There is often much difficulty in deciding on the proper treatment of an imperfectly descended testis when associated with hernia. Should the organ be returned into the inguinal canal with the hernia and be retained in this position by a truss, or should it be allowed to remain in its old position and its presence ignored? It must be remembered that they are often highly sensitive so that patients are consequently loth or even unable to submit to instrumental pressure. Under these circumstances an operation should be strongly urged upon the patient to submit to the radical cure, when the testis may either be brought down into the scrotum or be excised. I prefer the latter procedure, for the result is more satisfactory, especially as the ill-developed testis is of little functional use. If, however the patient, as is often the case, is averse to operation, he should be advised to return the hernia and the testis into the canal and to retain them by means of a truss; but if this is impossible it is advisable to leave the testis in its old position.

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[1] Atrophy and ill-development are often used as convertible terms, especially when applied to the testis, but it is important that they should be strictly confined within their proper limits.

The testis is sometimes found in the fascia in front of Scarpa's triangle, and may then make its way to any part of this space. The viscus nearly always emerges through the external abdominal ring into the thigh, and the cord can be felt distinctly on the outer pillar of the ring. The testis is usually situated in front of the femoral artery and is ill-developed, but it may be found in any part of this region when displaced by a hernia. I have seen instances of this form of ectopic testis without any hernial complication, but I have only had experience of two cases when so associated, and both were in the right side. Instances of interstitial hernia with a testis outside or within the hernial sac are not included in this category, for the testis has been displaced by the hernia into its new position through a gap in the aponeurosis of the external oblique or through the external ring, but not by the action of the gubernaculum testis.

An interesting example of this has been recorded by Dr. Francis, in a lad, aged 18, suffering from a right interstitial hernia whose upper spherical sac was situated between the internal and external obliqui, with a secondary elongated sac containing the testis passing down through the outer ring along the inner aspect of the thigh.[1]

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[1] Francis, A. G.: Quarterly Medical Journal, April, 1894.

This variety of ectopic testis associated with hernia is about sixteen times more common on the right than on the left side, and in 50 per cent. has a congenital origin, the remainder chiefly occurring about the age of puberty. As before stated two cases have come under my observation in private practice both in the right side, both congenital and associated with hernia. Testes in this situation are occasionally inverted or reverted or they may occupy any position between these.

Like ectopic crural testes either with or without associated hernia, so ectopic perineal testes occur more frequently on the right side, but they are usually uncomplicated with hernia, but if so only in later life. There are two varieties of this condition, one in which the testis lies in a skin pouch between the scrotum and the thigh, while the other lies in the perineum proper. Of the first variety twelve instances have come under observation and of the latter only three cases. It is probable that these hernial pouches in the cruro-scrotal cleft have originally contained the testis, into whose sac the hernia has descended which often attains considerable size. Herniæ in this situation are rarely observed until puberty has been fully developed, and are nearly always contained within the cavity of the tunica vaginalis testis. I have seen in a case of extreme hypospadias, where the glans penis was in close proximity with the anus, a hernia in the sac of a perineal testis situated close to this aperture. Two instances of peno-pubal testes have also come under my notice, but neither case was complicated with a hernia.

In hermaphrodites or in those whose sex is doubtful (who are however mostly males) we occasionally observe cases of inguinal hernia on one or both sides in connection with bodies, usually irreducible, in the situation of the external ring. The nature of these bodies although presumed to be testes cannot be considered proven unless examined microscopically.

Dr. Jones narrates the following case. "A girl (?), aged 21, had never menstruated nor given any symptoms thereof. The external organs were those of a female and the patient had always been brought up and treated as a woman. Under ether no uterus or Fallopian tubes could be discovered, but in the region of each external abdominal ring was a hard body which the author thought was an extruded ovary. They were very tender and irreducible. The pain in these enlargements was so great that she wished something done. Upon operation and after an opening had been made into the sacs surrounding these bodies no communication with the peritoneal cavity could be discovered, except some firm, fibrous bands which attached these organs to the internal surface of the abdomen. The swellings were on examination found to be testes and their removal led to the complete recovery of the patient.[1]

CONGENITAL HERNIA.

While many patients with misplaced testes become sooner or later the subjects of inguinal hernia, there are many whose testes, fully developed, are situated within the scrotum, but in whom complete occlusion of the processus vaginalis has altogether or in part failed to take place. Under these conditions a hernia may descend into this unclosed process and thus become associated with a testis fully or imperfectly developed. Hernia under these circumstances may occur for the first time at birth or at any age of life ; and it is therefore more exact to classify these varieties of hernia according to their anatomical relations with the vaginal process of the peritoneum, and to classify them under the general heading of *congenital hernia*, arranged under the following varieties :—

(1) *Herniæ* into the *cavity of the tunica vaginalis testis*, which strictly include the large majority of interstitial herniæ.

(2) *Herniæ* into the *funicular process* which descend into the upper part of the unclosed vaginal process.

(3) *Herniæ* into a post-tunica vaginal sac are commonly designated *infantile herniæ;* in which the protrusion is situated behind the dilated extension of the tunica vaginalis, which extends as far as the internal abdominal

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[1] Jones, C. N. D., M.D.: "Double Inguinal Hernia in an Hermaphrodite," New York Medical Herald, December 27, 1890.

ring. In this category may be included the *encysted herniæ*, which push before them an invaginated membranous septum into the enlarged cavity of an unclosed vaginal process.

(1) *Hernia* into the *sac of the tunica vaginalis testis* is one of the most frequent forms of congenital hernia and may occur for the first time at any period of life, from birth to extreme old age. In infants under the age of twelve months the position of the hernia can only be conjectured, for an exact diagnosis is only made sure on dissection or operation. Protrusions in children usually consist only of intestine since the omentum is so ill-developed that it is rarely long enough to descend into the hernial sac. From experience I have little doubt that in nearly all instances of hernia in infants, the protrusion is into the cavity of the tunica vaginalis testis. At a later period of life when the congenital protrusion descends into the scrotum it completely obscures the testis, as does the fluid of an ordinary vaginal hydrocele. A typical example of this variety of hernia forms a globular scrotal swelling within which the testis, usually ill-developed and sensitive, is situated, so that it cannot be detected until the intestine and omentum have been reduced.

The following tables record the percentages of hernia into the sac of the tunica vaginalis at the time of the patient's first application for relief and also at the time of its first discovery by the patient. The first table is arranged in quinquennial periods of life on the right and left sides respectively and includes no hernia which fails to fulfil all the clinical features of this variety of congenital hernia. The second table gives the ages, also in quinquennial periods, at which the patients first discovered the hernia, but it must be enjoined that it cannot be accepted as accurate, as it is often only a record of patient's recollection of its first appearance.

Tables giving the Percentage of Cases of Hernia into the Cavity of the Tunica Vaginalis Testis as they occur on each side, in the various Quinquennial Periods of Life :—

	TABLE V. At Time of Examination.		TABLE VI. At First Discovery.	
Ages.	Right. Percentage.	Left. Percentage.	Right. Percentage.	Left. Percentage.
0— 1	4·3	2·4	17·3	9·2
1— 5	5·6	4·4	6·1	2·2
6—10	8·3	9·0	7·1	5·0
11—15	9·4	7·3	11·2	7·2
16—20	17·2	14·0	11·3	8·0
21—25	4·08	3·05	3·6	3·1
26—30	2·1	1·2	1·7	1·6
31—35	2·3	1·0	·9	·8
36—40	0·67	0·81	·5	·5
41—45	0·38	0·42	·8	·6
46—50	0·20	0·25	·4	·5
51—55	0·47	0·40	·1	·3
56—70	0·58	0·17	—	—
	55·58	44·40	61·0	39·0

Reference to Table V. shows that hernia into the cavity of the tunica vaginalis may occur at any age, although, as might be expected, its frequency decreases as age advances. The percentage rapidly increases from birth to 20 years of age, after which it rapidly declines, so that at 70 years it is only represented by ·75 of the total number. It is not

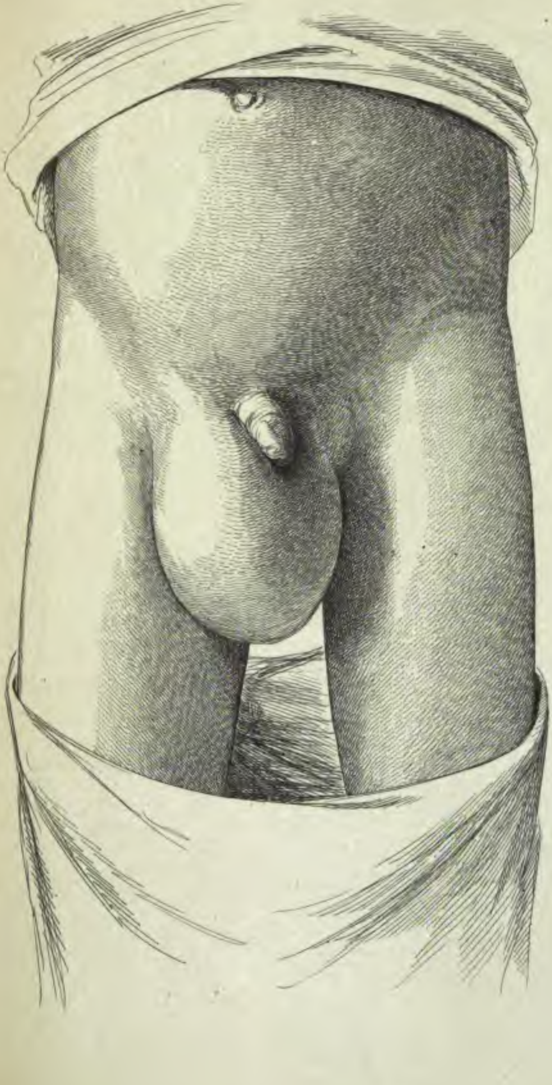
Fig. 20.

CONGENITAL HERNIA.

First variety.

Hernia into the cavity of the tunica vaginalis testis, showing its globular form, with the testis imbedded in the hernia.

Fig 20.



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improbable that hernia appearing at the later periods of life are recrudescences of this lesion in early life.

Hernia into the sac of the tunica vaginalis is relatively nearly equal on the two sides of the body throughout life, the proportion being 49·58 per cent. on the right side, and 48·60 per cent. on the left side, although in the aggregate the right side—according to Table V.—claims a larger percentage owing to the right side being more frequently affected than the left. Out of a total number of 8,342 cases of right inguinal hernia, 227 were examples of this variety of congenital hernia, and of 5,263 patients the subjects of left inguinal hernia, 125 were instances of congenital hernia, or in the proportion of nine cases on the right side to eight on the left. The recognition of this variety of hernia is important, for the prospect of obliteration of the vaginal process is not hopeful, and especially so in the unclosed canal of Nuck in females. I have often come across cases seemingly cured by trusses in patients under puberty, but the cure is apparent only since it is due to narrowing of the serous canal, which prevents the descent of a hernia, and not to complete closure of its walls.

In operating on patients in later life I have often observed this stenosis of the canal without the presence of hernia or fluid ; indeed the communication is so narrowed that it often barely admits the passage of a probe. It may, however, become enlarged to such an extent as to allow the descent of a considerable amount of intestine or omentum. I have a strong belief that in many instances no real closure takes place from the use of trusses, but that patency exists throughout life without the occurrence of hernia.

A case corroborating this inference occurred in the practice of Mr. Stanley, at St. Bartholomew's Hospital in 1859, who removed from a young man a malignant testis. During the operation the vaginal process was discovered to be patent and to allow easily the passage of the forefinger into the general peritoneal cavity. Prior to the operation the patient had never been the subject of hernia, nor even after his discharge from the hospital. This case demonstrates that there are other factors of hernia besides a patent canal or unduly large abdominal rings. One potent factor is the elongated mesentery, and it is not an unusual statement made by patients that herniæ occur suddenly for the first time after ill health or on recovery from a long illness. These herniæ when in the tunica vaginalis testis, are often of large dimensions, inasmuch as there is an already existing sac capable of receiving a considerable amount of intestine or omentum. Herniæ under these conditions easily become strangulated, and frequently contain intestine only. The prognosis is always serious, for the constriction is severe at the inner ring and this is increased when there is no omentum, which is often the case, to serve as a buffer at the seat of constriction. Hospital records show conclusively that strangulated congenital hernia entails much greater risk to life than a strangulated acquired inguinal hernia.

In early infant life, before any curative operation is advisable, the only course of treatment consists in the application of some mechanical support, and then in the large majority of patients the prognosis is good. Whether the canal by these means becomes permanently closed and subsequently converted into a fibrous cord, we have in the large number of cases no opportunity of knowing, but in later life we often see that the tube is still patent. The presence of fluid in the sac, constantly passing to and fro from the peritoneal cavity, renders the outlook much less satisfactory than if the contents of the sac consist only of intestine or omentum. When this condition is present an operation for its cure should be strongly advised as soon as practicable, and the results are eminently satisfactory. One of the most cogent reasons given by some authors for strongly urging the operation are the pain and inconvenience inflicted on these little patients from wearing trusses. I have no such experience of this excuse for operating, and if it does exist the responsibility rests with those who have the charge of these children.

In this, as in the funicular form of congenital hernia, I have observed that the constituents of the cord are more intimately adherent to the sac than in acquired hernia, so that the danger of injuring the vas deferens in these cases is largely increased, while the walls of the sac are usually very thin and diaphanous.

In ectopion vesicæ it is most usual to find it complicated with congenital hernia, and with partially retained testes situated in the inguinal canals. Six instances have come under my observation and all were the subjects of congenital hernia, and were subjected to operation for the cure of the exstrophy. In four instances the patients presented themselves some time afterwards for examination, when I ascertained that the testes had descended into an ill-developed scrotum. In two of these the hernia was still present, while in the other two the hernia was cured.

II.—*Herniæ* into the *funicular process* often occur, but under different phases, so that their diagnosis presents greater difficulties than the preceding variety, and there are fewer anatomical appearances on which we can rely for an accurate diagnosis. A well-marked example is usually very characteristic, for its elongated, sausage-shaped tumour, its uniform calibre throughout, in the line with the axis of the cord extending as far as the upper border of the testis, from which it is separated by a shorter or a longer constriction—all proclaim the congenital origin of the extrusion. All funicular herniæ, however, do not possess these definite characters. The accompanying illustration gives

Fig. 21.

CONGENITAL HERNIA,

ASSOCIATED WITH EXSTROPHY OF THE BLADDER.

Ectopion vesicæ—with partially descended testes and hernia into the cavity of the tunicæ vaginales test.:

Fig 21.

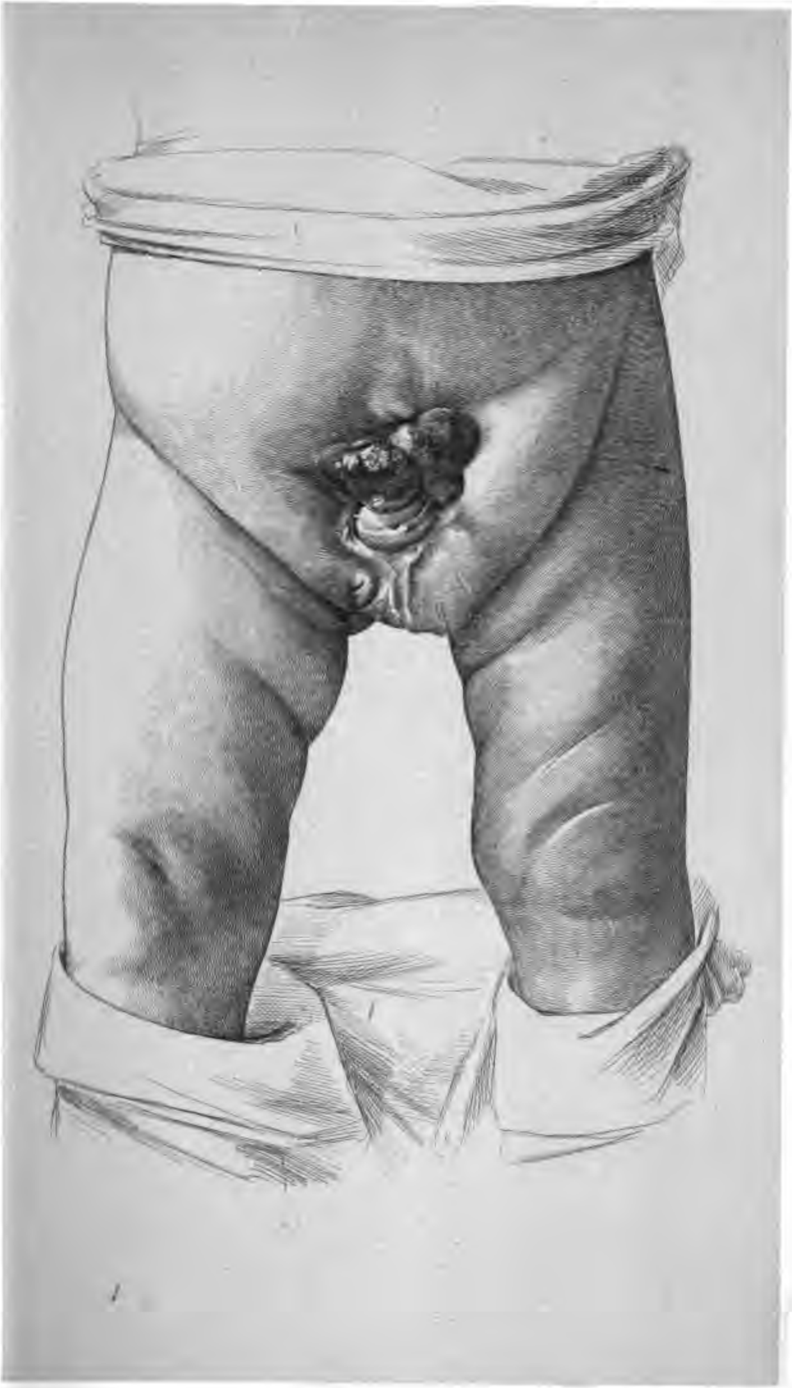

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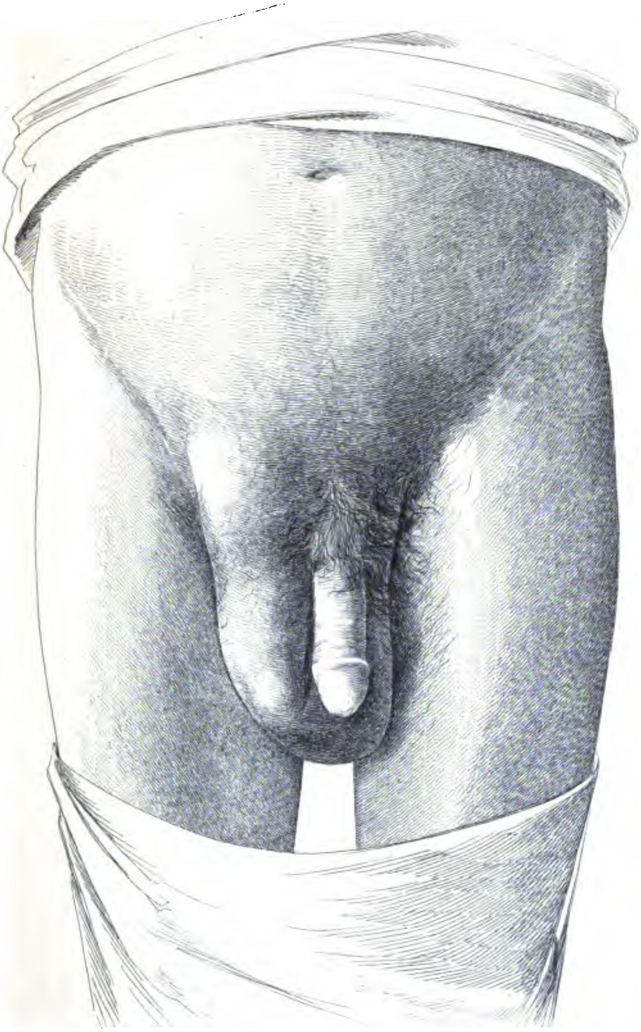
Fig. 22.

CONGENITAL HERNIA.

Second variety.

Funicular hernia, or hernia into the funicular process of the peritoneum, showing the treble constrictions; at the mouth of the external ring; immediately above the testis, and the third, midway between the upper and lower constrictions.

Fig 22.



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full expression to these diagnostic points, and shows, moreover, the three constrictions so often observed : the upper constriction corresponding to the outer ring; the second one to the annular constriction of the sac, to which I have already drawn attention ; the lower one to the septum separating the testis from the sac of the hernia.

Mr. Birkett has accurately demonstrated the nature of the funicular hernia, and is of opinion that most of the extrusions in infancy and early life are of this variety. This opinion can only be conjectural, as dissection alone can demonstrate its accuracy ; but I have a strong opinion that funicular hernia is more common than is usually credited. The proportion of hernia into the sac of the tunica vaginalis testis and into the funicular process is as one to every twenty-nine cases, or 3½ per cent. of all cases of inguinal hernia.

The nature of funicular herniæ was recognised by Camper, Hunter, and others.[1]

Though funicular herniæ are not so liable to strangulation, and are reduced with greater ease than those into the tunica vaginalis testis, they are not so easy of retention by mechanical means. The difficulty of the retention of funicular herniæ by means of trusses is a cogent reason for recommending the operation for the radical cure, and the results are most satisfactory.

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[1] Camper, Icones Herniarum, tab. x., fig. 3; Hunter, Works of, by Palmer, plates xxv. and xxvi.; W. Lawrence,

are primarily situated within the abdominal walls and enclosed within the sac of the tunica vaginalis, which contains an ill-developed and usually retained testis within the inguinal canal. In only two instances were the testes normally developed in the scrotum.

I have appended the details of 42 instances of interstitial hernia in males, 35 being on the right side, 5 on the left and 2 on both sides. The positions of the testes varied within considerable limits, but by far the larger number were retained within the canal.

TABLE VII.

SHOWING THE POSITION OF THE TESTES IN INTERSTITIAL HERNIA.

Testes.	Right.	Left.	Double.	Total.
In scrotum	2	—	—	2
High up in scrotum	2	—	—	2
Outside external ring	1	2	1	4
In the inguinal canal	26	3	1	30
In Scarpa's triangle	1	—	—	1
Not stated	3	—	—	3
	35	5	2	42

This number of interstitial herniæ was recorded out of a total of nearly 50,000 patients treated at the City of London Truss Society, showing the proportion of one to 1,100 cases. An analysis of this table shows that in two patients the testes were situated in their normal position in the right half of the scrotum; in two cases the testes were placed high up in the scrotum, both being on the right side; in four these organs were situated immediately outside the external ring; in thirty the testes were retained within the canal, and of these no less than twenty-six were on the right side; one was in the right Scarpa's triangle, while in three instances no mention was recorded of the position of the testes. In nearly all the corresponding half of the scrotum was ill-developed or absent, for in 34 cases the scrotum on that side was absent; moderately developed in three instances, and fully developed in two patients. When the testis lies immediately outside the external ring it has been probably extruded by the hernia, as it also was in the solitary case in which the testis and the hernia were found in Scarpa's triangle. The testes when arrested outside the external ring are prevented from further descent by the dense fibrous tissue found in this situation, and it is probably due to this dense tissue that this variety of hernia is found in this situation.

In interstitial hernia one or two pouches of a peritoneal sac are occasionally extruded through the external abdominal ring (fig. 26). Should only a single pouch exist, the testis, as a general rule, lies retained within the canal and the sac contains fluid, but should two or more pouches be found the testis lies in one of them and intestine in the other. In 75 per cent. the testis remains in its original position within the inguinal canal, and is usually more highly developed than when extruded through the external ring. Its retention within the canal is probably due to its larger size, which prevents its extrusion. If the testis is retained high up within

Fig. 23.

CONGENITAL HERNIA.

Fourth variety.

Right interstitial hernia—interparietal variety.

Fig 23.

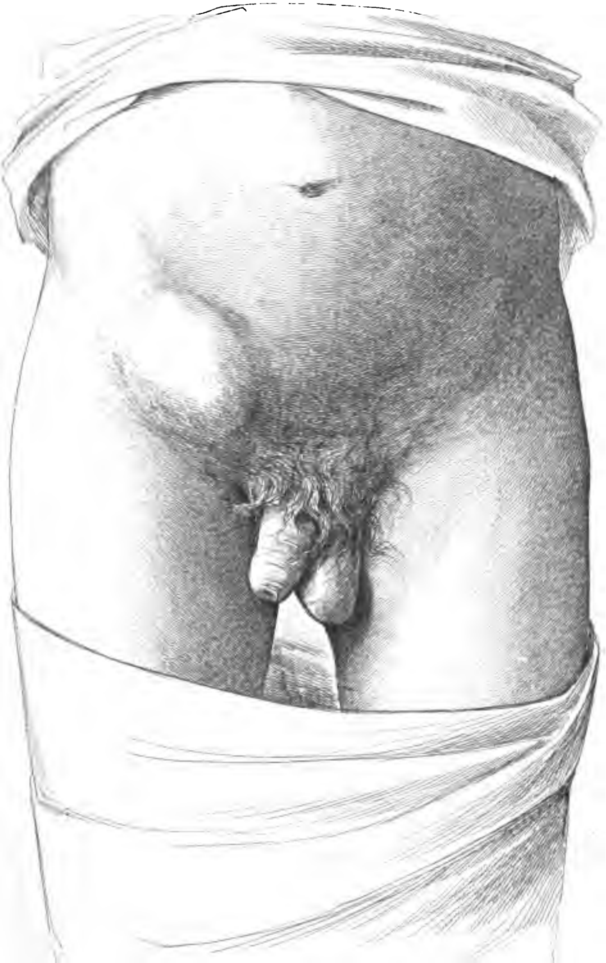

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Fig. 24.

CONGENITAL HERNIA.

Fourth variety.

Interstitial hernia—preparietal form—where the hernia has passed through a gap in the aponeurosis of the external oblique.

Fig 24.

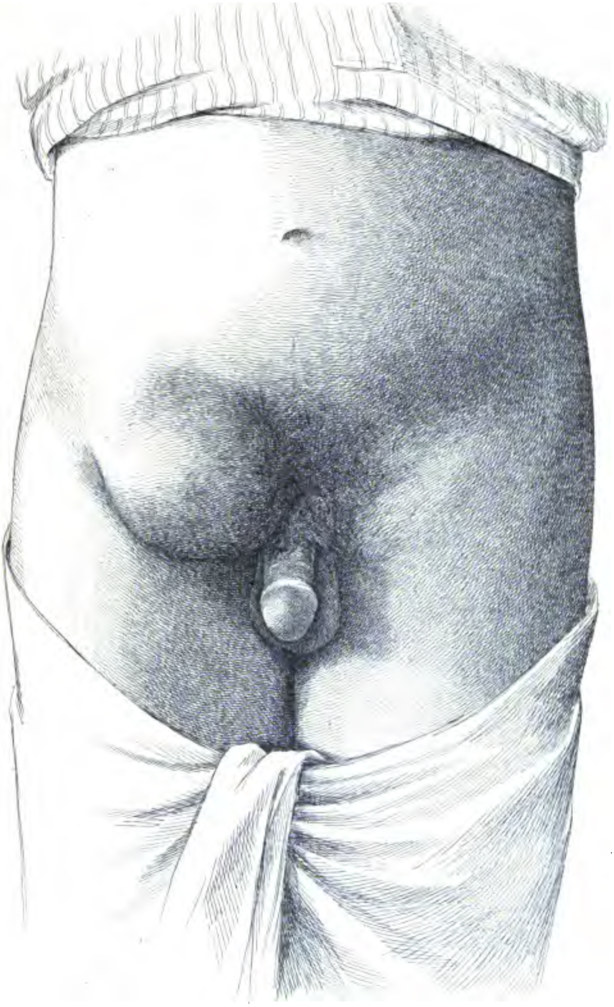

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Fig. 25.

CONGENITAL HERNIA.

Fourth variety.

Drawing showing adjustment of a truss for right interstitial and left scrotal hernia. Interstitial plate being on the right side, and a forked tongue on the left side of the truss.

Fig 25.

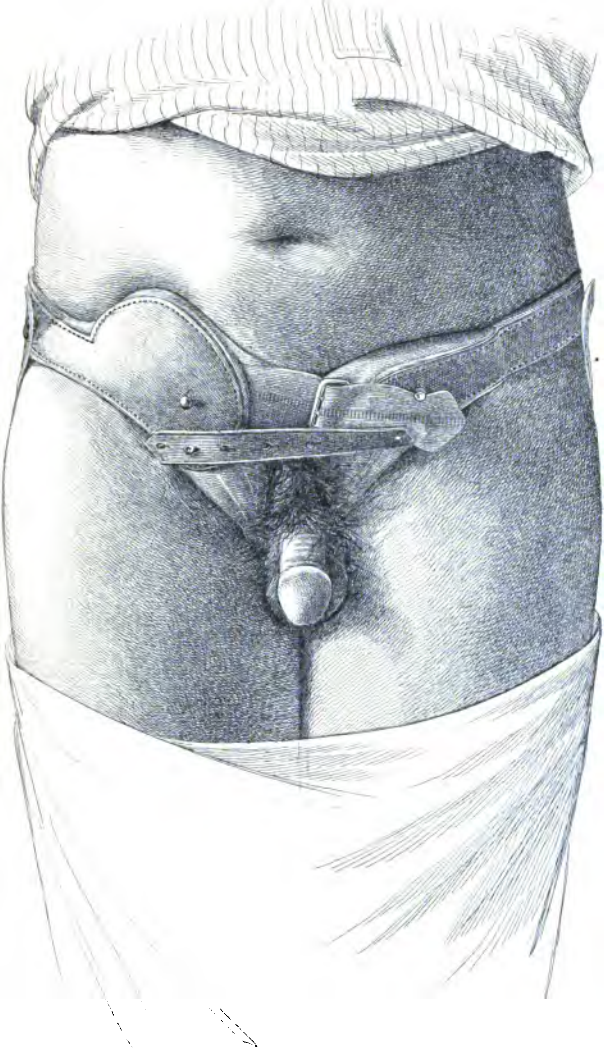

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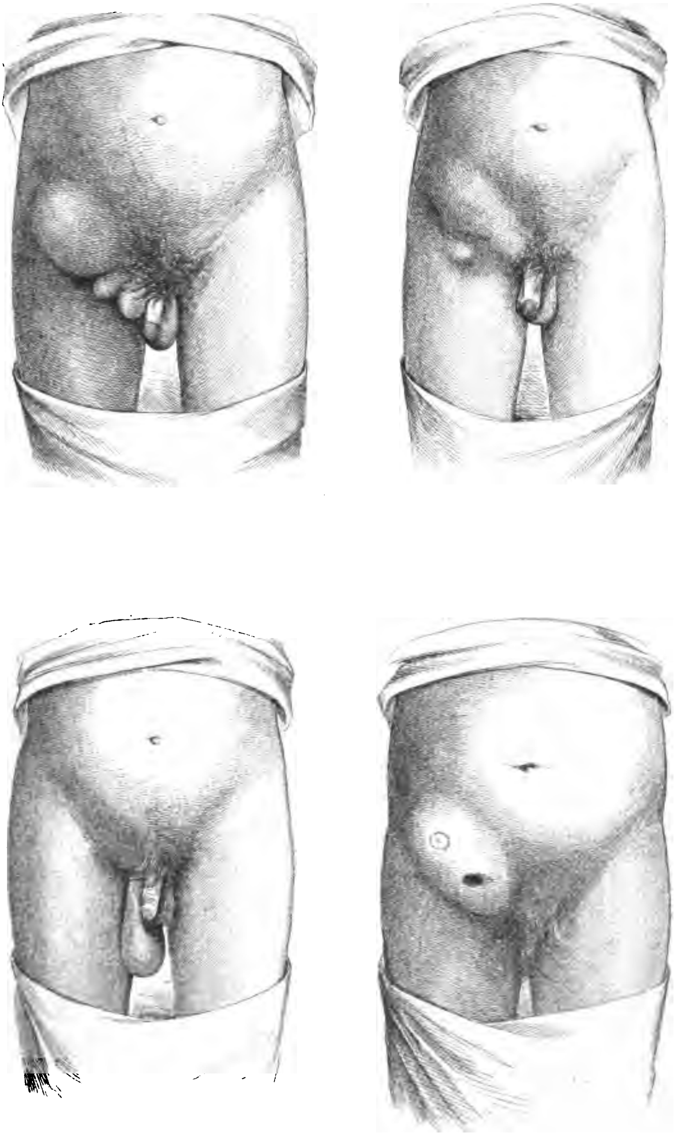
Fig. 26.

CONGENITAL HERNIA.

1. Interstitial hernia with two lower accessory pouches; the upper pouch contains intestine; in the lower pouch is situated the testis.
2. Interstitial hernia—interparietal—with an ectopic testis placed over Scarpa's triangle. The testis was extruded through the external abdominal ring, and lay outside the hernial sac.
3. Cruro-scrotal hernia containing the testis, lying in a pouch of skin between the thigh and the scrotum.
4. Interstitial hernia—preparietal—in a woman. The dark spot corresponds with the inner ring; the oval ring ○ is the ovary.

Fig 26.



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muscular form (fig. 27, 1). Occasionally an extension of the hernia passes downwards into the thigh through the external ring, and is termed hernia interstitialis cruralis[1] (fig. 27, 5). A variety of this form of hernia, called hernia *en bissac*, occurs under the following conditions : the interstitial protrusion, situated at first between the internal and the external oblique, subsequently splits the aponeurosis of the latter muscle and forms a large hernia in front of it. Thus there is a biloculated hernial sac, one in front of and the other posterior to the aponeurosis (fig. 27, 4).

(2) The hernia may split the aponeurosis of the external oblique from the outer ring to a variable distance upwards, or it may pass through the external ring and then take various directions. The protrusion lies in front of the external oblique aponeurosis and behind the deep fascia. This is pre-parietal or pre-aponeurotic form (fig. 27, 2).

(3) The hernia may ascend between the abdominal peritoneum and the fascia transversalis and then lies in the subperitoneal tissue, whence it may extend in different directions. This is the post-parietal or post-muscular variety (fig. 27, 3.) The different directions in which this hernia may extend are :—

(*a*) Downwards and backwards towards the iliac fossa, where the hernia rests on the iliac fascia ; hernia *interstitialis supra-iliaca*.

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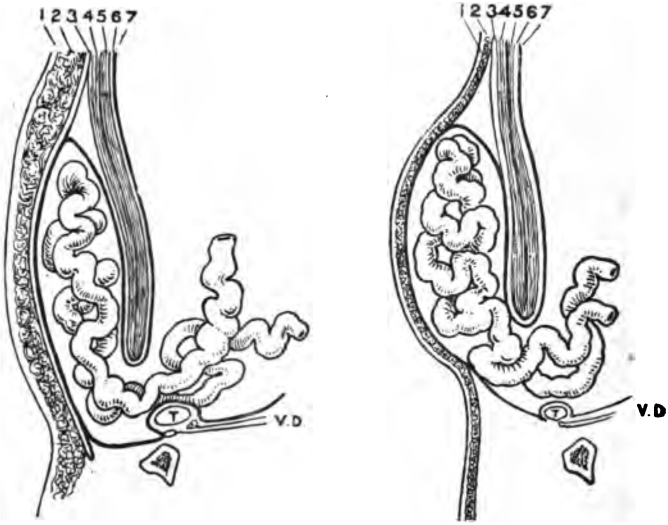
[1] See notes of a case by A. G. Francis, *oper. cit.*

FIG. 27.

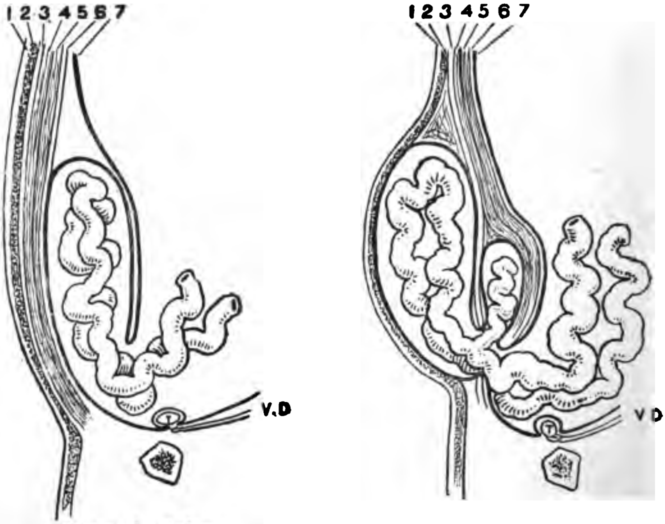
Diagrams illustrating the varieties of Interstitial Hernia, and their anatomical relations.

1. 2.



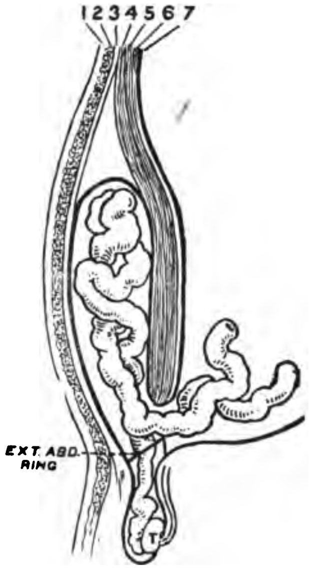
Inter-parietal form. Pre-parietal form.

3. 4.



Post-parietal form. Interstitial hernia *en bissac.*

5.



Cruro-interstitial form.

1.—Skin.
2.—Subcutaneous tissue, fat and deep fascia.
3.—Aponeurosis of the external oblique.
4.—Internal oblique.
5.—Transversalis.
6.—Fascia transversalis.
7.—Peritoneum.
T.—Testis.
V.D.—Vas deferens.

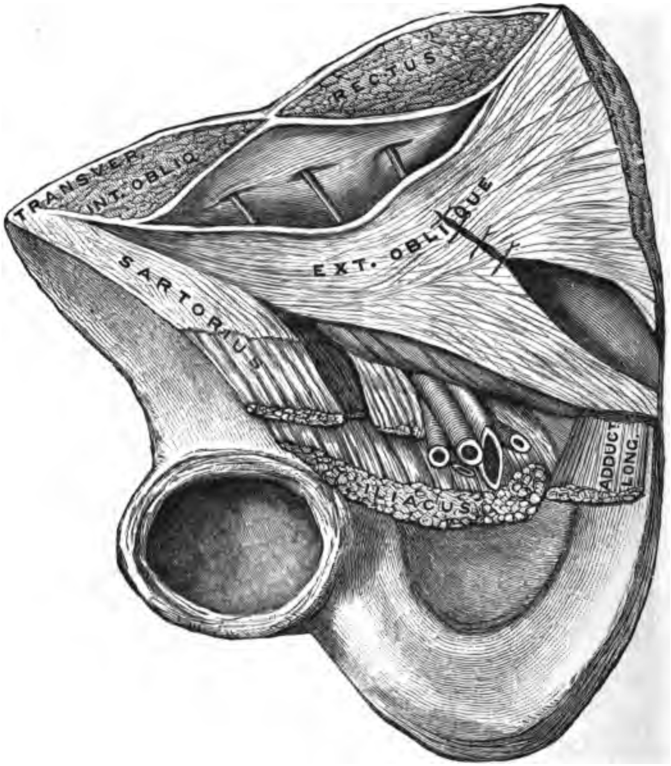
(β) Downwards and inwards towards the horizontal ramus of the os pubis, lying in front of the bladder ; hernia *interstitialis ante-vesicalis.*

(γ) Vertically upwards for some distance towards the umbilicus ; hernia *interstitialis ascendens.*

(δ) The hernia may protrude to a limited extent beyond the external ring within the testicular sac, or may push the testis in front of it and then pass into the scrotal or inguino-scrotal region ; hernia *interstitialis scrotalis* or hernia *interstitialis inguino-scrotalis.*

The first form of interstitial hernia (1) situated between the oblique muscles is probably the position of most interstitial herniæ in the first

FIG. 28.



Dissection of a specimen of right interstitial hernia, St. Bartholomew's Hospital Museum. Specimen 2157a.

instance, from which the other varieties are extensions. In its progress it separates the aponeurosis of the external oblique from the internal oblique, and in some instances part of the anterior sheath of the rectus abdominis, as shown in the diagram from a specimen in St. Bartholomew's Hospital Museum. This specimen was removed from a patient aged 45, on whom I operated for acute interstitial strangulation. He died a few hours afterwards from shock due to colliquative diarrhœa, the result of large amounts of drastic purgatives administered prior to his admission into the hospital. The specimen shows an external ring enlarged to four times its natural size. Behind the aponeurosis is a considerable cavity where the main hernial sac is situated. The sac contained about 18 inches of intestine together with the testis and omentum, both of which were removed and are preserved as specimens in the museum.[1] The separation is usually limited to the oblique muscles and rarely passes beyond the linea semilunaris, while the hernia does not extend higher than the level of the umbilicus. The outlines of this variety in the living subject are not well defined, and the hernial bulging in front is somewhat indefinite, its lower convex border being limited by Poupart's ligament. It is obscurely oval, and in the erect position its existence may be overlooked, especially in obese women. In the recumbent position no difficulty in the diagnosis is experienced, especially when the patient attempts to raise himself from the couch. I have seen the lateral bulgings of the abdomen mistaken for interstitial hernia, from which, however, they may be easily differentiated by the parallel depressed lines which pass upwards and outwards along the inguinal canal as far as a level with the umbilicus and then gradually fade off. The iliac bulgings are nearly always bilateral, and their inner depressions correspond with the outer borders of the recti abdominis.

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[1] St. Bartholomew's Hospital Museum. Specimens 2157a, 2136, and 2139.

Professor Keen comments on the absence of diagnostication prior to operation, and in his observations of such a case of pro-peritoneal hernia which terminated fatally after operation, says, "that this case presents another illustration of the fact that a pro-peritoneal hernia is almost never diagnosticated before operation."[1] If by pro-peritoneal Professor Keen means the post-parietal variety, I quite admit its probability; but if this case was of the inter- or pre-parietal varieties of interstitial hernia I cannot subscribe to this statement, for a correct diagnosis of these varieties presents little difficulty.

In the second variety (2)—pre-parietal—the hernia, after dilating the inguinal canal to its full limit, emerges for a short distance through the external ring, which it subsequently splits up in the direction of its aponeurotic fibres and passes forwards through the gap thus formed. The gradual expansion of the primary sac through the elongated gap forms another or secondary sac, which lies in front of the aponeurosis, and then may extend far and wide over it. If, however, there is no gap in the aponeurosis the hernia passes through the outer ring and then turns abruptly upwards at an acute angle in front of the aponeurosis, where it presents an oval, elongated tumour. This variety is less common than the former, but its diagnosis is easy, for the tumour has well-defined globular borders, a wider range of swelling, and bags downwards over Poupart's ligament (fig. 24). This hernia is often irreducible, a condition noted by Professor Keen in his case already quoted. When strangulated this form of hernia is not easy of reduction, as the aperture of the inner ring is difficult to locate. The lower borders of interstitial hernia are more defined than the upper and inner borders, especially so in the pre-parietal variety; but in the post-parietal form there is often no inguinal swelling observable; and Astley Cooper draws attention to this absence, for he says that "he has frequently found it—the hernia—in the dissection of the bodies of persons who have never been suspected of labouring under the disease or worn a truss."

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[1] Keen, International Medical Magazine, vol. i., p. 25.

Interstitial hernia may be discovered for the first time at any age of life, although the anatomical conditions requisite for its existence must have existed at birth. In my mind there can be little doub that protrusion takes place years prior to its first discovery, and that the statements made by patients as to its first occurrence are not to be relied upon.

In the 42 cases of interstitial hernia given in the next table, I find that in nearly 45 per cent. the date of the first discovery of the hernia was under one year; in 16 per cent. between the ages of 1 and 20; in 29 per cent. between 21 and 40 years of age; in 5 per cent. between 41 and 60 years; and in 5 per cent. between 61 and 80 years of age.

TABLE VIII., SHOWING THE DATES OF THE FIRST DISCOVERY OF INTERSTITIAL HERNIA.

Age Periods.	Cases.
Under 1 year of age	19
Between 1 and 20 years	7
" 21 " 40 "	12
" 41 " 60 "	2
" 61 " 80 "	3
Total ...	42

The frequency of the occurrence of interstitial hernia in the earlier periods of life affords proof of some congenital defect in the position of the testis, as these organs are usually ill-developed and are situated within the canal. Interstitial hernia cannot be considered common in comparison with the total number of ruptured males, seeing that out of 49,390 patients seen at the Truss Society between January, 1889, and November, 1900, only 42 cases were recorded as the subjects of interstitial hernia, or one in 1,175 cases (see appendix of cases).

The difficulty of localising the position of the inner ring is well exemplified in the case of the patient (fig. 26, case 1), who stated that as long as he could remember he noticed the right groin was larger than the left, but that he only gave concern to it when he was 24 years of age. He then wore a truss, and has continued its use ever since, his age now being 47 years. There is at the present time a prominent swelling in the region over the iliac fossa containing intestine, sharply defined on its lower and outer limits, but less distinct on its upper boundary. Connected with the lower and inner end of this hernia are two small globular pouches separated by a deep oblique groove from the larger tumour, while they themselves are divided by a deep narrow chink. The lower pouch contains an ill-developed testis, while the upper one is filled with resonant intestine. The outer ring was large, and the inner ring on operation, was found to be situated near the upper and outer extremity of the hernial sac. The patient stated that the upper sac gradually enlarged to its present dimensions from his constant endeavours to reduce the hernia.

Incidentally I may draw attention to the comparative frequency of interstitial or quasi-interstitial herniæ in women, for they present many features of difference from those prevailing in the opposite sex. Our records at the Truss Society show that 18 cases occurred out of 13,583 patients, so that the proportion is 1 in 760 patients, or nearly twice as frequent as in males. This form of hernia in women often attains large dimensions, and in one patient, aged 47 years, the protrusion, which was pre-parietal, extended up to the right costal arch above, to the linea alba on the inner side, and overhung the thigh for 3 inches. It measured 11 inches in its transverse diameter and 7 inches in its vertical measurement, and was, moreover, irreducible. In another patient (fig. 27, case 4), a woman aged 53 years, a hard oval body, of the size and shape of an ovary, was felt in the upper part of the sac after partial reduction of the hernia.

In eighteen cases, of which detailed notes exist, two only were observed at birth; eight between the ages of 21 and 40 years; four between 41 and 60 years of age; and three between 61 and 70 years. In all I had to rely on the statements of the patients for these dates of the first appearance of the hernia.

The causes of interstitial hernia in women differ from those which influence its occurrence in males, and although some may be associated with misplacement of the ovaries, the large majority are due to distension and subsequent laxity of the abdominal muscles consequent on pregnancy, most of the patients being mothers of large families.

The treatment of interstitial hernia in males by instruments I cannot but recognise as neither scientific nor satisfactory, since the pressure of a truss is mainly directed to smothering the protrusion and in most instances it fails in effecting complete retention of the extruded hernia. As a rule the deviated testes accommodate themselves to the truss pressure without much inconvenience to the patient, if the instruments be properly adjusted, and the organ may be safely left to take care of itself (fig. 25.) The higher up in the canal the testis is situated the less is the annoyance to the patient.

Operative measures for the reduction and cure of interstitial hernia are not to be recommended, for the large separation of the abdominal muscles render the complete approximation of the parietes almost impracticable and the reconstruction of the hernial aperture equally imperfect. The size of the hernia is often so large that the abdominal cavity is unable to accommodate such a large accession of the extruded viscera, so that if an operation for the cure be contemplated, an enterectomy of considerable magnitude must be faced to allow of the complete reduction of the extruded mass.

In my lecture to-day I have not, Mr. President, referred largely to the published literature of the subject I have selected, for it has been my object as I feel sure it is also your wish, that I should record the results of my personal experience gained in this special field of general surgery.

APPENDIX.

INTERSTITIAL HERNIA IN MALES.

No.	Year	Name	Age	Date of First Discovery	Position of Testis	Side of Hernia	Remarks
1	1890	B. H. ...	48	26	Retained in canal	R.	Enormous entero-epiplocele; both testes completely retained. R. has all the appearance of being interstitial under the skin.
2	1898	W. A. H....	35	17	Retained in canal	R.	In 1887 R. interstitial plate, large interstitial; R. side of scrotum not developed; testis obscured in hernia. In 1890 no protrusion; testis not felt.
3	1893	I. I. ...	74	71	Not stated...	D.	Double interstitial herniæ.
4	1889	W. G. L....	35	Cong.	Retained in canal	R.	Both testes retained. Interstitial on right.
5	1891	D. M. ...	50	3	Retained in canal	R.	Large interstitial, overhanging thigh, reduced with difficulty. External ring split up to length of three inches. Testis just outside internal ring.
6	1889	I. P. ...	43	38	Not stated...	R.	Testis small, size of filbert, tender. Hernia interstitial, size of two fists.
7	1891	G. F. ...	46	22	Retained in canal	R.	Interstitial plate. Testis in canal, omentum irreducible. At an earlier note there was some irreducible enterocele. In 1888 Testis outside external ring; in 1892 it was in canal.
8	1891	T. B. E. ...	18¾	Cong.	Retained in canal	R.	In 1894, R. testis just within external ring; no protrusion on left. In 1898 a well marked interstitial on R. apparently between the external and internal obliqui muscles; R. testis in canal. In 1891 interstitial on R. retained testis. Hernia now also on L. in the tunica vaginalis testis.
9	1892	B. F. ...	34	33	Testis in Scarpa's triangle	R.	Interstitial on right. Hernia on both sides.
10	1890	W. H. ...	60	Cong.	Retained in canal	R.	Truss worn in infancy; cured at age of 26. In 1862 large interstitial bubonocele as large as a cocoanut; testis retained in tumour. In 1885 enormous entero-interstitial. In 1890 large interstitial, irreducible; testis retained.

11	1889	W. P. ...	42	32	Retained in canal	R.	In 1885 enormous interstitial on R. forming an oval tumour extending upwards as far as the borders of costal cartilages on R., and internally as far as the middle line; R. testis retained; hernia irreducible. In 1887 a small portion of interstitial hernia now comes out through the external abdominal ring.
12	1890	R. J. R. ...	53	Cong.	In scrotum	R.	In 1874 interstitial on R.; canal dilated up to anterior iliac spine, and descending into scrotum.
13	1889	M. S. ...	74	61	R, retained, L. at external ring	D.	In 1882 interstitial plates to truss, hollow pad on L.; interstitial on both sides. R. testis high up in canal; L. testis at mouth of external ring. In 1892 interstitial plate on L.; L. testis lies in canal.
14	1891	J. T. ...	59	40	Not stated...	R.	Interstitial on right. Hernia on both sides.
15	1892	J. J. T. ...	18	Cong.	In canal ...	R.	Interstitial plate truss. In 1892 testis at lower end of canal. Enterocele difficult to reduce. In 1897, interstitial with testis retained in canal; canal dilated like an iliac abscess.
16	1893	W. U. ...	61	Cong.	In canal ...	R.	In 1873 large bubonocele with testis in front, and towards bottom of hernia. There seems to be fluid in the tunica vaginalis testis, separate from hernia. Large interstitial.
17	1889	A. W. ...	36	Cong.	In canal ...	R.	Ascends as high as level of umbilicus. In 1890, interstitial on R.; testis just within canal, half its normal size.
18	1890	G. W. ...	58	24	Retained in canal	R.	In 1883, seems to have been once interstitial, for testis lies high up in canal near iliac spine. In 1885, interstitial. In 1897, interstitial plate truss, same condition.
19	1892	J. W. ...	69	Cong.	In canal ...	R.	Interstitial in 1876; probably congenital. Hernia in the tunica vaginal testis, with fluid in front of canal, and not reducible.
20	1892	A. B. ..	45	Cong.	Not stated...	R.	Interstitial. Testis small.
21	1891	F. B. ...	44	Cong.	High up in scrotum	R.	Large mass of irreducible omentum in canal. Testis high up in scrotum; looks like interstitial. Testis below.
22	1896	W. C. ...	11	Cong.	In canal ...	R.	Interstitial. Testis retained under truss.
23	1895	G. D. ...	4	Cong.	In canal ...	L.	Interstitial. Testis retained in canal.
24	1896	E. D. ...	2months	Cong.	In canal ...	R.	Interstitial. Testis retained.
25	1893	J. H. ...	49	49	In canal ...	R.	Interstitial. Testis retained in canal. Hernia enters upper part of scrotum. External oblique very thin.

INTERSTITIAL HERNIA IN MALES—*Continued.*

No.	Year	Name	Age	Date of First Discovery	Position of Testis	Side of Hernia	Remarks
26	1892	J. T. S. ...	55	35	External to outer ring	L.	Interstitial at first, but hernia has now made its way into scrotum. Testis just external to outer ring, which is large.
27	1897	F. R. ...	42	11	In canal ...	R.	R. testis in canal small, but not tender; interstitial hernia. First wore truss at age of 17.
28	1895	O. W. A....	43	20	In canal ...	L.	Double inguinal hernia. Interstitial plate. L. testis retained in canal; interstitial.
29	1898	H. C. ...	19	Cong.	High up in scrotum	R.	Interstitial, mounting as high as anterior superior iliac spine; testis high up in scrotum.
30	1896	F. S. F. ...	15	2	In scrotum	R.	Interstitial; testis has tendency to return into canal after reduction of hernia. In 1898 no protrusion; R. testis in scrotum, and half its normal size; external ring large.
31	1899	W. G. ...	72	30	Outside external ring	R.	Interstitial plate. R. testis just outside external ring; interstitial portion probably deep to aponeurosis of external oblique. L. testis inflamed.
32	1897	J. W. H. ...	4 months	Cong.	R. in canal	R.	Interstitial on right. L. testis in canal.
33	1899	J. H. ...	43	26	Retained ...	R.	Interstitial with small testis on external oblique, rather external to position of internal ring. No scrotum on right.
34	1899	E. K. ...	13	Cong.	In canal ...	L.	Left testis in canal. Hernia appears interstitial and probably between muscles; controlled efficiently by ordinary truss.
35	1896	A. L. ...	40	35	In canal ..	R.	R. testis in canal. R. half of scrotum undeveloped; interstitial.
36	1900	F. L. ...	40	20	Outside external ring	L.	As a child he remembers some trouble with the left testis. At 17 he entered army, and at 20 noticed hernia; now there is a typical interstitial hernia. Testis small, rather tender; can be pushed into canal, but descends again with hernia. Part of the hernia lies in scrotum and part on the abdominal walls (? between muscles).
37	1898	G. P. ...	8 weeks	Cong.	In canal ...	R.	Interstitial in the tunica vaginalis testis. Hernia does not descend into scrotum.

38	1900	F. P. ...	24	Cong.	Retained ...	R.	R. testis in abdomen. L. testis small, tender, and slips in and out of canal. Hernia is interstitial; both sides of scrotum developed.
39	1900	C. R. ...	41	Cong.	Retained ...	R.	Large interstitial. Testis not in scrotum.
40	1899	W. G. S. ...	33	20	Retained ...	R.	Right testis in canal, slightly smaller than normal; tender.
41	1899	P. W. ...	22	19	Retained ...	R.	Interstitial on right. R. testis completely retained, with large interstitial hernia; aponeurosis of external oblique greatly separated in right. L. testis bulges structures forwards at inner ring.
42	1900	A. W. ...	64	59	Retained ...	R.	R. testis in canal. Hernia interstitial.

INTERSTITIAL HERNIA IN WOMEN.

No.	Year	Name	Age	Date of First Discovery	Children	Side of Hernia	Remarks
1	1889	C. A. ...	58	24	9, after 3rd	L.	Inguinal hernia on left side in 1877, before marriage; interstitial, large.
2	1893	M. L. A. ...	63	30	—	R.	Interstitial on right.
3	1889	M. B. ...	47	40	16, after 14th	R.	R. interstitial; enormous interstitial ascending to costal arch and to middle line. Overhanging thigh; irreducible. Measures transversely, 11 inches; vertically, 7 inches.
4	1891	M. B. ...	74	68	Not stated	R.	Interstitial.
5	1898	H. B. ...	55	53	9	R.	Interstitial.
6	1889	J. C. ...	69	32	7	L.	Large interstitial and labial; interstitial plate truss.
7	1898	J. E. ...	49	37	4	L.	Interstitial. After all children.
8	1890	E. F. ...	58	44	11	R.	Interstitial. Patient is so stout that it is difficult to make out the aperture of the hernial exit.
9	1899	E. F. ...	76	61	6	L.	Interstitial beneath the external oblique.

INTERSTITIAL HERNIA IN WOMEN—*Continued.*

No.	Year	Name	Age	Date of First Discovery	Children	Side of Hernia	Remarks
10	1889	S. A. G. ...	43	25	4	L.	Interstitial. An oval hard body is felt after return of intestine. Reduced with difficulty (? ovary).
11	1896	E. G. ...	60	47	8	R.	Interstitial.
12	1890	M. A. J. ...	77	55	—	R.	Interstitial; interstitial plate. In 1887 large interstitial.
13	1890	N. L. ...	2¾	Cong.	—	R.	In 1888, double hernia. Large interstitial and labial on R. Tumour rises to level of umbilicus, limited above by a sharp ridge. In Sept. of same year; note is, no protrusion now.
14	1897	R. M. ...	40	Doubtful.	Single	R.	Interstitial.
15	1880	E. P. ...	3 months	Cong.	—	R.	In 1888 large interstitial inguinal.
16	1895	E. Q. ...	48	23	9	L.	Interstitial plate.
17	1897	M. R. ...	57	30	Single	L.	Hernia is interstitial, and has made its excursion through the aponeurosis of external oblique, so as to lie in front of it. At lower border of protrusion is an oval body like an ovary. All are irreducible.
18	1898	A. P. ...	72	66	3	L.	Left interstitial truss with plate and tail; interstitial. Opening in abdominal walls can be felt in situation of inner ring. Hernia all comes through external ring.

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